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Levels of Air Pollutants in School Environments in Hawassa City, Ethiopia, and Assessment of Potential Human Health Risks

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Abstract

This study highlights significant concerns about air pollution in Hawassa City, Ethiopia, particularly within school environments. It found elevated levels of volatile organic compounds (VOCs), particulate matter (PM2.5 and PM10), and inorganic gaseous pollutants (NO2, CO, SO2), both indoors and outdoors. Highest total VOCs (TVOCs) concentration (83 µg/m3) was observed in the classroom of School 2, while the smallest TVOC concentration, 37 µg/m3 in the playground of School 8. The highest cumulative cancer risk (CCR × 106) and the total hazard ratio indicator (THRI) values were 126 and 1.58E-01 respectively, in the classroom of School 4. The hazard quotient (HQ) value indicated moderate health risks from PM exposure in many locations. Additionally, a notable proportion of outdoor sites had air quality deemed unhealthy for sensitive groups, with PM levels surpassing WHO standards in most sampling sites. The findings highlight significant health risks for children, including potential harmful effects from benzene exposure, as indicated by CCR and THRI values. Overall, the results underscore the urgent need for improved air quality management in schools to protect vulnerable populations from adverse health effects associated with air pollution.

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